Ramgarhia Polytechnic College, Phagwara

Mechanical Engineering Department

Head of The Department: Er. Gaurav Kumar

Name of the Faculty: Kuldip Singh Cheema

Discipline: ME

Semester: 1st

Subject: Applied Mathematics– I

Lesson Plan Duration: 16 Weeks

RATIONALE

RATIONALE Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, partial fractions, matrices etc. for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus.

Course Outcomes

After undergoing this course, the students will be able to:

CO1.   Apply Complex Number and its representation for two dimensional designing and related calculations. They will be able to apply this knowledge in many engineering problems like alternating current/voltage. The concept of rotation of a vector using iota will enable them solve many engineering problems.

CO2.   Apply the basics concepts of Permutation and Combination to find out how many possible ways or arrangements are possible for a particular problem and its solutions. They will be able to count without actual counting. They will be able to apply this concept in understanding of Binomial Theorem and demonstrate better reasoning in different analytical situations.

CO3.   Calculate the approximate value of certain expressions and extract roots of certain expression in many engineering problems by Application of Binomial Theorem

CO4.   Resolve a fraction to further fractions by applying basics concepts of Partial Fractions. They will be able to use and apply this knowledge in Integral Calculus

CO5.   Solve engineering problems that are in matrix format by applying the basic understanding of Matrices and their properties, which are usually less computational. Further, this understanding will work as a backbone for the use and development of software in many engineering applications. Study of matrices and its properties will also provide educational base for continuing study and provide solution to many engineering problems by different methodologies.

CO6.   Design and solve related problems like constructions of roads, dams, bridges and calculation of height, distance, elevation etc. By the understanding of basic concepts of Trigonometry and 2 D geometry, they will be able to apply the same in different situations in surveying, navigation, astronomy and many other engineering problems. They will also be able to draw graphs of trigonometrical functions for many applications in the solution of engineering problems.

CO7.   Write the equations of a geometric shape used in many engineering problems such as straight line and circle. With the use of coordinate geometry, they will be able to explore and evaluate the idea of location, graph, linear relationships between two forms, and distance between two lines, which will be useful in solving engineering problems. They will be able to calculate the distance between a point and a line.

PO ⟹	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO ⇩							
CO1	●				●		●
CO2	●				●		●
CO3	●				●		●
CO4	●				●		●
CO5	●				●		●
CO6	●				●		●
CO7	●				●		●

Syllabus

Units	Details	Hours
1.	Algebra 1.1 Complex Numbers: Complex number, representation, modulus and amplitude. 1.2 Basics and properties of logarithms. 1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors). 1.4 Meaning of npr & ncr (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof), first and second binomial approximation with applications to engineering problems. 1.5 Determinants and Matrices – Expansion of determinants (upto 3rd order, using properties and otherwise), solution of equations (upto 3 unknowns) by Crammer's rule, definition of Matrices with types, addition, subtraction and multiplication of matrices (upto 3rd order), Minors and Co-factors, inverse of a Matrix by Adjoint method (upto 3rd order), solution of simultaneous equations (upto 3rd order) by Matrix method. Area of a triangle using determinants.	*(30hr)*
2.	Trigonometry 2.1 Concept of angle, measurement of angle in degrees, grades and radians and their conversions. 2.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). 2.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.	(25hr)
3.	Co-ordinate Geometry 3.1 Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to Polar coordinates and vice-versa 3.2 Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), inter section of two straight lines, concurrency of lines, angle between straight lines, parallel and perpendicular lines, perpendicular distance formula, conversion of general form of equation to the various forms. 3.3 General equation of a circle and its characteristics. To find the equation of a circle, given: * Centre and radius * Three points lying on it * Coordinates of end points of a diameter.	(25hr)

Reference Books:

1.   Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2.   Applied Mathematics, Vol. I & II by SS Sabharwal & Dr Sunita Jain, Eagle Parkashan, Jalandhar
3.   Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
 4.   Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	

Lesson Plan

WEEK	Lecture/Day	Theory Topic including Assignment,Test and Parent Teacher meetings.
1ST	1	Introduction to Applied Mathematics and general formula
	2	1.1 Complex Numbers: Complex number, representation. modulus and amplitude
	3	Practice
	4	Practice
	5	1.2 Basics and properties of logarithms.
2ND	6	Practice
	7	1.3 Partial fractions (linear factors
	8	Practice
	9	Repeated linear factors, non-reducible quadratic factors excluding repeated factors).
	10	Practice
3RD	11	1.4 Meaning of npr & ncr (mathematical expression).
	12	Practice
	13	Practice
	14	Binomial theorem (without proof) for positive integral index (expansion and general form);
	15	Practice
4TH	16	Binomial theorem for any index (expansion without proof),
	17	Practice
	18	first and second binomial approximation with applications to engineering problems.
	19	Practice
	20	1.5 Determinants and Matrices – Expansion of determinants (upto 3rd order, using properties and otherwise),
5TH	21	Practice
	22	solution of equations (upto 3 unknowns) by Crammer's rule,
	23	Definition of Matrices with types, addition, subtraction and multiplication of matrices (upto 3rd order),
	24	Minors and Co-factors,
	25	Inverse of a Matrix by Adjoint method (upto 3rd order)
6TH	26	Solution of simultaneous equations (upto 3rd order) by Matrix method.
	27	Area of a triangle using determinants.
	28	Practice
	29	Parent Teacher Meet-1
	30	House Test-1
7TH	31	Trigonometry, general introduction
	32	2.1 Concept of angle, measurement of angle in degrees, grades and radians and their conversions.
	33	Practice
	34	Practice
	35	2.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof).
8TH	36	Practice
	37	Practice

	38	Practice
	39	Practice
	40	Product formulae (Transformation of product to sum, difference and vice versa).
9TH	41	Practice
	42	Practice
	43	Practice
	44	Practice
	45	T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2)
10TH	46	Practice
	47	Practice
	48	Practice
	49	Practice
	50	2.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.
11TH	51	Practice
	52	Practice
	53	Practice
	54	Practice
	55	Parent Teacher Meet-2
12TH	56	House Test-2
	57	Co-ordinate Geometry -Introduction and basics
	58	3.1 Cartesian and Polar coordinates (two dimensional),
	59	conversion from Cartesian to Polar coordinates and vice-versa
	60	Practice
13TH	61	3.2 Slope of a line,
	62	equation of straight line in various standards forms (without proof);
	63	(slope intercept form, intercept form,
	64	one-point form, two-point form,
	65	Practice'
14TH	66	symmetric form, normal form, general form)
	67	Practice
	68	inter section of two straight lines,
	69	Praactice
	70	concurrency of lines,
15TH	71	angle between straight lines, parallel and perpendicular lines,
	72	perpendicular distance formula,
	73	conversion of general form of equation to the various forms.
	74	3.3 General equation of a circle and its characteristics.
	75	To find the equation of a circle, given: * Centre and radius *
16TH	76	Three points lying on it
	77	* Coordinates of end points of a diamete
	78	House Ttests-3
	79	Parent Teacher Meet-3
	80	Practice